

## Michigan Response to Fordham Report

In 2013, the Thomas B. Fordham Institute published an evaluation of the Next Generation Science Standards, along with a review and grades of each state's science standards. While this is just one of several reviews of the standards, it is noteworthy in that many of the oppositional responses to the proposed standards reference this particular evaluation and utilize arguments from this document as a part of their critique of the standards.

In order to better understand the nature and validity of these arguments, an analysis of the review process utilized in the creation of this document identifies a number of methodological biases, unfounded assumptions, and flawed rationales for the assessment of these standards. In order to better understand these issues, the following responses are provided to claims made by the Fordham Institute.

Claim #1. Much essential content of science was omitted.

- Prominent scientists such as Bruce Alberts, former President of the National Academies of Science, Michigan content experts and reviewers, and others pushed for a reduction of content, but the preservation of learning progressions. That was done and validated. The conceptual knowledge builds as it should.
- Some states, including Michigan, currently have high school standards that include concepts not found in the NGSS, and therefore, proposed MSS. In Michigan, all students are expected to meet the Essential expectations (a subset of the HSCE in the four science disciplines). The NGSS, and therefore, proposed Michigan Science Standards, are for all students, and all students are expected to achieve proficiency with respect to all of the performance expectations in the NGSS. (See the comparison of Fordham State Science Standards Grades and NAEP Science scores that follows.)
- During the development of the NGSS, scientists, college professors, and technical instructors from across the country, were engaged in identifying content that was critical for success in college and career.
- Fordham's critique is in stark contrast to the feedback received through outreach conducted by the scientific community, 26 states leading this effort, state science supervisors, the public, and the expertise of the 41 standards writers. Scientists and educators, including Nobel Laureates, have attested to the high-quality content and rigor of the NGSS.
- The NGSS were built from the vision of the National Research Council's A Framework for K-12 Science Education, which draws on the research of the past fifteen years in science education to redefine the criteria for evaluating standards.
- Fordham's analysis of content is based on their own identified set of standards, which is aligned to

Claim #2. The grade-to-grade progression that was a strength of the NRC Framework was not fully realized in the NGSS. The result was that some content that was never explicitly stated in earlier grades was nevertheless assumed in later grades.

- The Framework presented a grade-band progression. The NGSS go beyond this delineation to provide grade level standards for grades K-5 and grade band standards for middle school (grades 6-8) and high school.
- The NGSS are written as Performance Expectations (PEs) that represent outcome statements of what students should know and be able to do at the end of a grade or grade band, *after* instruction. The PEs are not instructional or assessment tasks. Teachers, districts, and curriculum developers will need to determine how to scaffold instruction to meet the performance expectations that define the NGSS.
- The NRC conducted a review of the NGSS, and will publish the NGSS with the following statement in the introduction: “The review process determined that the NGSS, released to the public in April of 2013 and published in this volume, are consistent with the content and structure of the *Framework*.” (See NRC Review of the NGSS at <http://www.nextgenscience.org/next-generation-science-standards>)

Claim #3. A number of key terms (e.g., “model” and “design”) were ill defined or inconsistently used and a number of actual errors were scattered throughout.

- Michigan’s process for addressing multiple such definition issues in standards is that commonly identified terms and concepts of the standards can be clarified outside of the adopted standards document by identifying these terms in guidance. Because guidance is not specifically adopted in Michigan’s approach for adoption of academic standards, we have the flexibility to work with educators to develop resources that provide much more comprehensive support to educators around key terms utilized in the standards.
- The NGSS includes extensive support for interpreting the intent of the terms “modeling” and “design” as used in the practices (Developing and Using Models; Constructing Explanations and Designing Solutions) and as used in Engineering Design. (See Appendix F – Science and Engineering Practices in NGSS and Appendix I – Engineering Design in NGSS.) These can be utilized by Michigan educators, and may be incorporated into future guidance from MDE around implementation supports for the proposed standards.

Claim #4. Recommended “practices” dominated the NGSS, relegating essential knowledge—which should be the ultimate goal of science education—to secondary status.

- The NGSS do not relegate essential knowledge of content to a secondary status.
- The NGSS promote the learning of content knowledge-in-use -- the purposeful integration of three dimensions (content/disciplinary core ideas, practices, and crosscutting concepts) so students apply developing content knowledge to deepen their understanding of disciplinary core ideas (content). *America’s Lab Report* provides data to support the strength of integration (increased content mastery, scientific reasoning, and interest in science).  
[http://www.nap.edu/catalog.php?record\\_id=11311](http://www.nap.edu/catalog.php?record_id=11311)
- Standards consisting of long lists of correct scientific facts are not necessarily rigorous and accurate. The NGSS are written to avoid the shallow coverage of

content that requires only identification and description or counts on “understand” and “know” to define performance.

- The NGSS are based on carefully selected practices and disciplinary core ideas. The eight NGSS practices deserve special attention. Rather than equating “scientific practice” with “inquiry,” as other standards tend to do, they recognize a full range of key inquiry, application, and communication practices. These practices form the foundation for college and career readiness as defined in the NGSS, the College Board Standard for College Success (CBSCS) for 6-12 and AP Science, and the ACT College Readiness Standards.
- The new AP course requirements and standards for success have been accepted as the equivalent of entry level college/university science courses. The NGSS align well with AP science practices and enduring understandings.

Claim #5. The articulation of “assessment boundaries” in connection with many standards threatened to place an unwarranted ceiling on important learning. Yes, teachers can go above and beyond what the boundary suggests, but with time and resources scarce, how many will actually teach students—even advanced students—content and skills that they know in advance “won’t be on the test”?

- This argument avoids the underlying notion of academic standards as framed by Michigan, and by the development team for NGSS. This notion is that academic standards set the minimal expectations for all students, and that all students should meet or exceed these standards. The Fordham argument suggests that states, school districts, and educators will only seek to address the minimal expectations, and that the “floor” will become the “ceiling” in terms of instructional offerings to address performance expectations. This is a speculative argument with no actual rationale that is based in data. Michigan’s own data for course offerings in Advanced Placement topics in science is an example of this fallacy, as Michigan’s High School Content Expectations for Science clearly fall short of the content of these courses, and yet growing numbers of schools are enrolling students in these programs.
- The NGSS assessment boundaries serve to focus large-scale assessment on the application of specific science knowledge.
- The NGSS are not intended to be an exhaustive list of all that could be included in a student’s science education, nor should they prevent students from going beyond the standards where appropriate.
- The NGSS form a foundation for advanced work in the sciences.
- The Michigan Science Standards, as proposed for adoption, do not specifically include the assessment boundaries developed for NGSS. As such, they are

When NGSS was first considered for adoption in Michigan, the grade and data from the Fordham report were being used to challenge the possible transition to these standards in Michigan. While the extensive analysis and response promoted the transition to these standards, these questions were asked of prominent faculty members at Michigan colleges and

universities who have known expertise in STEM education topics. These are some of their responses to the question, “Why move to these standards in Michigan?”

- Science educators have long recognized that scientific knowledge and scientific practice are inseparable in the real world: all knowledge is embedded in practice, and all practice requires knowledge. Yet standards documents, including Michigan’s current standards, have routinely separated knowledge from practice, with separate sections or chapters for content, inquiry, nature of science, etc. The NGSS do a far better job than prior standards, of weaving together practices, crosscutting concepts, and disciplinary core ideas in statements of performance expectations. (Anderson)
- The NGSS employs technical language and a framework that is far clearer and more specific than other standards documents, including Michigan’s current science standards, about the nature and limits of expected student performances. This major step forward for the field will pay dividends as the NGSS are used as a basis for assessment, research, and curriculum development. (Anderson)
- Our current science standards are no longer adequate to meet the educational needs of K – 12 students. The NGSS are based on solid foundation of what is known about the teaching and learning of science and what students should know and be able to do to live in the 21st century. With the release and adoption of NGSS, Michigan has a once-in-a-generation opportunity to dramatically affect the teaching and learning of science in our state to build a 21st century workforce. (Heller)
- The Next Generation Science Standards are an improvement over the existing state standards. We can and should use this opportunity to build on these new standards by bringing greater coherence to science instruction. (Schmidt)